HRS DOCUMENTATION RECORD

GRANTS CHLORINATED SOLVENTS PLUME
CERCLIS ID: NM0007271768
CIBOLA, NEW MEXICO

February 2004

New Mexico Environment Department
Ground Water Quality Bureau
Superfund Oversight Section

CONTENTS

TABLES

FIGURES

HRS Documentation Record--REVIEW COVER SHEET

Name of Site: Grants Chlorinated Solvents Plume

Contact Person:

Site Investigation: Chris Meehan
Geoscientist, New Mexico Environment Department
(505) 476-3777

Pathways, Components, or Threats Not Evaluated

Surface Water Pathway
The Surface Water Overland/Flood Migration Component, and Groundwater to Surface Water Migration Component, were not scored because the site scored on a contaminated groundwater plume. There is no observed release for the Surface Water Pathway.

Soil Exposure Pathway
There is observed contamination for the Soil Exposure Pathway. The area of observed contaminated soil covers approximately 11,000 square feet. At least seven residents live where the area of observed contamination lies within their property and their residence is within 200 feet. The Resident Population Threat, and Nearby Population Threat, were not scored because the site scored on a contaminated groundwater plume. Scoring this pathway would not add significantly to the site score.

Air Migration Pathway
The Air Migration Pathway was not scored because the site scored on a contaminated groundwater plume. There is no observed release for the Air Migration Pathway

HRS DOCUMENTATION RECORD

Name of Site: Grants Chlorinated Solvents Plume

Date Prepared: February 2004

CERCLIS ID: NM0007271768

EPA Region: 6

Street Address of Site: First Street and Jefferson Street

City, County and State: Grants, Cibola, New Mexico

General Location in the State: The Grants Chlorinated Solvents Plume site is a groundwater plume contaminated with chlorinated solvents in the vicinity of First and Jefferson Street in the City of Grants, Cibola County, New Mexico. The groundwater plume covers approximately 4 acres in a mixed commercial/residential area (see Figure 1, Regional Location Map and Figure 2, Site Location Map).

Topographic Map: United States Geological Survey (USGS) 7.5 Minute Topographic Map, Grants Quadrangle.

Latitude:	**Longitude:**
35° 09' 20.88"	-107° 50' 38.04"

Pathway Scores

Air Pathway	NS
Groundwater Pathway	100
Soil Exposure Pathway	NS
Surface Water Pathway	NS
HRS SITE SCORE	**50**

NOTES TO THE READER

1. For the purposes of this Hazard Ranking System (HRS) Documentation Record, a plume of contaminated water has been identified in the City of Grants, Cibola County, New Mexico. The boundary of the plume is defined by ground water samples from monitoring wells that meet the observed release criteria under the HRS. The site has been defined as a ground water plume with no identified source.

2. The following rules were applied when citing references in this Documentation Record:

    A. If a reference has an original page number, that page number was cited.

    B. If the reference cited has no original page number or the pagination is not complete, then page numbers were assigned in sequential order as they appear in the reference.

3. Hazardous substances are listed by the names used in the January 2004 Superfund Chemical Data Matrix (SCDM) (Reference 2). It should be noted that perchloroethylene is commonly referred to as PCE. Synonyms for perchloroethylene include: tetrachloroethylene, tetrachloroethene, and perc. These distinctions have been made because some reports and/or analytical data may refer to this substance in one of these manners.

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SITE SUMMARY

The Grants Chlorinated Solvents Plume site is a ground water plume contaminated with chlorinated solvents in the vicinity of First and Jefferson Street in the city of Grants, Cibola County, New Mexico (Figure 1) (Ref. 53, p. 1). The site is located in a primarily mixed commercial/residential area (Ref. 53, p. 1). The area of the groundwater plume is defined by ground water samples collected from monitoring wells in the upper shallow alluvial aquifer (Ref. 53, p. 10, 12). The precise extent of the groundwater plume has not been defined, but currently covers an area of approximately 4.2 acres (Ref. 53, p. 10).

Chlorinated solvents detected in groundwater at the site include tetrachloroethene (PCE), trichloroethene (TCE), cis & trans-1,2 dichloroethene (c,t-1,2-DCE), 1,1-DCE, and vinyl chloride (VC) (Ref. 24, p. 7-9; Ref. 26, p. 7; Ref. 28, p. 2,3,5,6; and Ref. 29, p. 8,9). Several inorganic CERCLA hazardous substances were also observed at significant levels in monitor wells above background concentration in groundwater at the site. These include arsenic, beryllium, cadmium, chromium, lead, nickel, and zinc (Ref. 25, p. 7-9; and Ref. 27, p. 6).

The New Mexico Environment Department (NMED) has been the primary agency involved in the investigation of this ground water plume. The NMED Underground Storage Tank Bureau discovered the ground water plume in August of 1993 during the investigation of leaking service lines for unleaded gasoline tanks at the Allsups #200 site (Ref. 6, p. 3). Groundwater sampling detected the occurrence of PCE, TCE and DCE above federal drinking water standards in three monitor wells (Ref. 2, pp. BII-23, BII-24, BII-5; Reference 6, Appendix E; Ref. 53, p. 2). Subsequent groundwater sampling in the spring of 1994 identified these same chlorinated solvents in three additional monitor wells installed at the site (Ref. 6, Appendix E; Ref. 53, p. 2).

On December 12, 1994, this site was referred to the NMED Ground Water Quality Bureau Assessment and Abatement Section (NMED/AAS) (Ref. 12). On May 5, 1995, NMED/AAS performed a series of sampling on five monitor wells at the Allsups 200 Site. Three of these monitor wells contained chlorinated solvents exceeding federal standards (Ref. 2 ; Reference 13, pp. 1,4, and 5).

On September 15, 1998, this site was officially transferred from NMED/AAS to NMED Superfund Oversight Section (SOS) for pre-CERCLIS screening. Subsequently the NMED SOS completed a Preliminary Assessment (PA) investigation in October of 1998 (Ref. 14), and a Site Inspection (SI) investigation in April 2001 (Ref. 53). Investigative activities included previewing previous site information, interviewing nearby residence and commercial business owners, performing a passive soil vapor survey, installing six monitor wells, and collecting groundwater, soil, and air samples. A brief summary of the information collected during the PA and SI investigations by the NMED is provided in the following paragraphs.

A source for the release of chlorinated solvents to ground water could not be positively identified. Investigations by NMED have identified several potential source areas including primarily Holiday Cleaners at 715 N. First Street (Ref. 16, p. 99, 117, 118; Ref. 33, Ref. 53,

p. 6,7), R&L Laundry at 604 N. First Street (Ref. 16, p. 124-126, Ref. 53, p. 8), an abandoned dry cleaning facility at 605 First Street (Ref. 16, p. 75, 76, 79, 125, 127; Ref. 53, p. 8), and a former Mountain States Telephone and Telegraph Company facility at 621 Geis Street (Ref. 16, p. 39, 124; Ref. 32, p. 1; Ref. 53, p. 7-8).

Ground water sampling has indicated that a total of 15 monitor wells have been impacted by chlorinated solvents (Figure 3). These wells are completed in a shallow alluvial aquifer. Most of the monitor wells were completed to less than 15 feet below ground surface (Ref. 6, p. 37-40; Ref. 7, p. 1-6; Ref. 8, p. 9, 23-28; Ref. 10, p. 20-25; Ref. 15, p. 2-7; Ref. 22, p. 2-6; Ref. 42 p. 1-4; Ref. 43, p. 1-2). The deepest monitor wells impacted by chlorinated solvents at the site is GMW-1, which was completed at a depth of 47 feet (Ref. 22, p. 1).

The highest concentration of PCE in groundwater at the site was encountered in monitor well GMW-6 at 26,000 ug/L (Ref. 26, p. 7). Monitor well W-6 had the highest concentrations of TCE and cis-1,2-DCE at 6500 ug/L and 2400 ug/L respectively (Ref. 24, p. 9). Monitor well W-8 had the highest concentration of trans-1,2-DCE at 55 ug/l (Ref. 28, p. 3). W-8 was also the only well where VC or 1,1-DCE was detected in groundwater (Ref. 29, p. 8-9). VC was detected at 42 ug/L. 1,1-DCE was detected at 6 ug/L.

Water samples collected from a basement at 700 First Street confirmed that contaminated groundwater was seeping into the basement (Ref. 23, pp23-24; Reference 30, p. 7). Water samples collected from standing water on the basement floor contained PCE, TCE, and cis-1,2-DCE at 20 ug/L, 12 ug/L and 5 ug/L respectively. A sample collected from the basement sump showed much higher levels of contamination. PCE, TCE, and cis,trans-1,2-DCE were detected at 2300 ug/L, 1200 ug/L, and 474 ug/L. VC was also detected in water from the sump at 1 ug/L. This water is pumped from the basement sump into the Grants municipal sewer system.

The majority of the population within four miles of the site relies on municipal water systems (Ref. 53, p. 16). Five municipal wells are located within a four-mile radius of the site (Ref. 38). Two of the municipal wells are owned by the City of Grants, one is owned by the Village of Milan, and two are owned by the Town of San Rafael (Ref. 53, p. 16). All of these wells produce water from the San Andres Limestone and Glorieta Sandstone Aquifer, which is considered a karst aquifer (Ref. 53, p. 15 – 17). These wells have not been impacted by chlorinated solvents from the site (Ref. 49, 50, 51).

Twenty-four soil samples were collected using a hand auger from 15 separate locations at a depth of one to five feet below ground surface (Ref. 16, p. 102-106; Reference 23, p. 11-22). Seven soil sampling locations positively identified soils contaminated with chlorinated solvents at less than two feet below ground surface (Ref. 16, pp102-106, Reference 23, pp11-21; Reference 31). The area of observed soil contamination lies within residential property boundaries at 700 First Street, 708 First Street, 621 Geis Street and 701 Geis Street (Ref. 53, p. 20). The area of observed contaminated soil covers approximately 11,000 square feet and is within 200 feet of the residences located on each of these properties (Ref. 53, p. 20). At least seven residents live where the area of observed contamination lies within their property and their residence is within 200 feet (Ref. 16, pp. 75,108, and 136).

WORKSHEET FOR COMPUTING HRS SITE SCORE

		S	S^2
1.	Groundwater Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	100	10,000
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	0.00	
2b.	Groundwater to Surface Water Migration Component (from Table 4-25, line 28)	0.00	
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	0.00	
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	0.00	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	0.00	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10,000
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root	50	

TABLE 3-1 --GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Likelihood of Release to an Aquifer: San Andres/Glorieta			
1. Observed Release	550	0.00	
2. Potential to Release:			
2a. Containment	10	10	
2b. Net Precipitation	10	1	
2c. Depth to Aquifer	5	3	
2d. Travel Time	35	5	
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500	90	
3. Likelihood of Release (higher of lines 1 and 2e)	550		90
Waste Characteristics:			
4. Toxicity/Mobility	(a)	10,000.	
5. Hazardous Waste Quantity	(a)	10,000.	
6. Waste Characteristics	100		100.00
Targets:			
7. Nearest Well	(b)	20	
8. Population:	(b)		
8a. Level I Concentrations	(b)	0.00	
8b. Level II Concentrations	(b)	0.00	
8c. Potential Contamination	(b)	898	
8d. Population (lines 8a + 8b + 8c)	(b)	898	
9. Resources	5	0.00	
10. Wellhead Protection Area	20	0.00	
11. Targets (lines 7 + 8d + 9 + 10)	(b)		918
Groundwater Migration Score for an Aquifer: San Andres/Glorieta			
12. Aquifer Score [(lines 3 x 6 x 11)/82,500][c]	100		100
Groundwater Migration Pathway Score:			
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100		100

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

SOURCE DESCRIPTION

2.2 Source Characterization

2.2.1 Source Identification

Number of the source: 1

Name: Groundwater Plume

HRS Source Type: Other

Description of the source: The source is a groundwater plume primarily containing chlorinated solvents. The plume covers approximately 4 acres in a mixed residential/commercial area in Grants, NM. The groundwater plume size is based upon analyses of groundwater samples collected from area monitor wells. Chlorinated solvents detected in groundwater at the site include tetrachloroethene (PCE), trichloroethene (TCE), cis & trans-1,2 dichloroethene (c,t-1,2-DCE), 1,1-DCE, and vinyl chloride (VC) (Ref. 24, p. 7-9; Ref. 26, p. 7; Ref. 28, p. 2,3,5,6; and Ref. 29, p. 8,9). A total of 15 monitor wells have been found to be impacted by chlorinated solvents (Figure 3). These wells are completed in a shallow aquifer. Most of the monitor wells were completed to less than 15 feet below ground surface (Ref. 6, p. 37-40; Ref. 7, p. 1-6; Ref. 8, p. 9, 23-28; Ref. 10, p. 20-25; Ref. 15, p. 2-7; Ref. 22, p. 2-6; Ref. 42 p. 1-4; Ref. 43, p. 1-2). The deepest monitor wells impacted by chlorinated solvents at the site are V-1 and GMW-1. These wells were completed to depths of 29 and 47 feet respectively (Ref. 6, p. 41; Ref. 22, p. 1).

The highest concentration of PCE in groundwater at the site was encountered in GMW-6 at 26,000 ug/L (Ref. 26, p. 7). Monitor well W-6 had the highest concentrations of TCE and cis-1,2-DCE at 6500 ug/L and 2400 ug/L respectively (Ref. 24, p. 9). Monitor well W-8 had the highest concentration of trans-1,2-DCE at 55 ug/l (Ref. 28, p. 3). W-8 was also the only well where VC or 1,1-DCE was detected in groundwater (Ref. 29, p. 8-9). VC was detected at 42 ug/L. 1,1-DCE was detected at 6 ug/L.

Several inorganic CERCLA hazardous substances were also observed at significant levels in wells above background concentration in groundwater at the site. These include arsenic, beryllium, cadmium, chromium, lead, nickel, and zinc (Ref. 25, p. 7-9; Ref. 27, p. 6).

No municipal or residential drinking water wells were identified as being impacted by this plume (Ref. 49, p. 1-15; Ref. 50, p. 1-15; and Ref. 51, p. 1-13).

Although, no one facility was clearly identified as the source of the contamination, several potential sources were investigated and/or identified. Previous investigations have suggested several potential source areas including primarily Holiday Cleaners (Ref. 16, p. 99, 117, 118; Ref. 33, Ref. 53, p. 6,7), R&L Laundry (Ref. 16, p. 124-126, Ref. 53, p. 8), an abandoned dry cleaning facility at 605 First Street (Ref. 16, p. 75, 76, 79, 125, 127; Ref. 53,

p. 8), and a former Mountain States Telephone and Telegraph Company facility (Ref. 16, p. 39, 124; Ref. 32, p. 1; Ref. 53, p. 7-8).

Adequate documentation attributing the hazardous substances to one or more of the potential source areas has not been identified according to the HRS criteria. A groundwater plume with no identified source was used for HRS scoring. The groundwater plume with no identified source was characterized as the site source based on the following:

- The plume was established solely by sampling, using the criteria for an observed release to the Groundwater Migration Pathway (see Table 1).
- The level of effort to identify the original source(s) of the hazardous substances was a "Site Inspection" (SI) Report dated March 2001.

The CERCLA hazardous substances used to establish an observed release to the Groundwater Migration Pathway are PCE; TCE; c,t-1,2-DCE; 1,1-DCE, VC, arsenic, beryllium, cadmium, chromium, lead, nickel, and zinc.

Location of the source, with reference to a map of the site: (See Figures 1 and 3)

The Grants Chlorinated Solvents Plume is located in the City of Grants, Cibola County, New Mexico. The groundwater plume is located near the intersection of First Street and Jefferson Street. The area of the groundwater plume is approximately 153,400 square feet (4.2 acres). The groundwater plume is bounded by Monroe Street to the north, Washington Street to the south, Second Street to the west, and Geis Street to the east. Since this source is a groundwater plume (with no identified source), the center of the plume is used to locate the geographic location of the contamination (Ref.1, 51595). The geographical coordinates for the center of the plume are 35^{o} 09' 20.88" latitude and –107^{o} 50' 38.03" longitude (Ref. 4, Grants USGS Quadrangle; Ref. 58, p. 3).

Source type for HRS evaluation purposes: Other
The source type "other" is used when defined source types do not apply. This source consists of a groundwater plume with no identified source and is therefore classified and evaluated as the HRS source type "other" (Ref. 1, p. 51587).

Containment:

Gas release to air: The air migration pathway was not evaluated; therefore, gas containment was not evaluated.

Particulate release to air: The air migration pathway was not evaluated; therefore, particulate containment was not evaluated.

Release to Groundwater: On March 23-24, 1999, September 9, 1999, November 30, 1999, and April 17, 2000, the New Mexico Environment Department collected groundwater samples from several monitor wells (Ref. 16, p. 48-61, 72-74; Ref. 23 p. 1-7, Ref. 53 p. 4, and 5). These sampling events documented an observed release to groundwater documenting PCE; TCE; c,t-1,2-DCE; 1,1-DCE, VC, arsenic, beryllium, cadmium, chromium, lead, nickel, and zinc (Ref. 24, p. 7-9; Ref. 25, p. 7-9; Ref. 26, p. 7; Ref. 27, p. 6; Ref. 28, p. 2,3,5,6; Ref 29, p. 8,9; Ref. 53, p. 10-11). A containment factor value of 10 is assigned to the source as a source that has "No Liner," as specified in Table 3-2 of the HRS Rule (Ref. 1, p. 51596).

Release via overland migration and/or flood: The surface water migration pathway was not evaluated; therefore, surface water containment was not evaluated.

2.2.2 Hazardous Substances Associated With a Source

The groundwater plume source contains "hazardous substances" for which an observed release was established within the shallow groundwater at the site. The hazardous substances listed below in Table 1 were detected in samples collected by the New Mexico Environment Department (NMED) in 1999 and 2000 during the SI investigation (Ref. 16, p. 48-56, 72-74; Ref. 23, p. 1-10). All of the constituents listed in Table 1 are considered a hazardous substance under Section 102 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Ref. 54, p. 45323-45325, 45327, 45328, 45332, 45334, 45338, 45340).

Fifteen monitor wells were found to contain concentrations of chlorinated solvents. Chlorinated solvents detected in groundwater at the site include PCE; TCE; c,t-1,2-DCE; 1,1-DCE, and VC (Ref. 24, p. 7-9; Ref. 26, p. 7; Ref. 28, p. 2,3,5,6; and Ref. 29, p. 8,9).

An observed release was also established for several inorganic CERCLA hazardous substances. These include arsenic, beryllium, cadmium, chromium, lead, nickel, and zinc (Ref. 25 and 27). An observed release of arsenic was identified in groundwater in 4 monitor wells (Ref. 25, p. 7-8; Ref. 27, p. 6). Beryllium was observed in 6 monitor wells (Ref. 25, p. 7; Ref. 27, p. 6). Cadmium and lead were identified in 3 monitor wells (Ref. 25, p. 7; Ref. 27, p. 6). Chromium was observed in 2 monitor wells (Ref. 27, p. 6). An observed release of nickel and zinc were established in only one well (Ref. 27, p. 6).

For the purposes of HRS scoring, three monitor wells have been designated as the background groundwater sampling locations. These are monitor wells CMW-4, CMW-5, and W-5. All three monitor wells were sampled during the March 1999 sampling event for the SI (Ref. 16, p. 48-56). These wells were chosen as background wells because they are hydraulically up gradient from the Grants Chlorinated Solvents Plume (see Figures 5 and 6, Groundwater Contour Maps for Water Level Measurements in March 1999 and July 2000), are screened at similar depths to most of the monitor wells that define the plume area (see Table 2, Monitor Well Construction Details and Groundwater Surface Elevations), and did not show any contamination of chlorinated solvents (Ref. 24, p. 8). Locations of these background monitor wells can be found in Figures 2, 5, and 6.

Source No. 1 – Groundwater Plume (With No Identified Source)
Source Hazardous Substances

Table 1

Hazardous substance	Evidence	
	Sample Designation, ID Number, Date	Reference
Arsenic	GMW-5, MFC-Y16, 11/30/99	Ref. 23, p. 4; Ref. 27, p. 6
	TMW-2, MFE-M26, 3/23/99	Ref. 16, p. 48 and 49; Ref. 25, p. 7
	W-7A, MFE-M36 and M37, 3/24/99	Ref. 16, p. 57; Ref. 25, p. 9
Beryllium	GMW-3, MFC-Y13, 11/30/99	Ref. 23, p. 2-3; Ref. 27, p. 6
	GMW-4, MFC-Y14, 11/30/99	Ref. 23, p. 3; Ref. 27, p. 6
	GMW-5, MFC-Y16, 11/30/99	Ref. 23, p. 4; Ref. 27, p. 6
	GMW-6, MFC-Y17, 11/30/99	Ref. 23, p. 5-6; Ref. 27, p. 6
	W-7A, MFE-M36 and M37, 3/24/99	Ref. 16, p. 57; Ref. 25, p. 9
Cadmium	GMW-5, MFC-Y16, 11/30/99	Ref. 23, p. 4; Ref. 27, p. 6
	GMW-6, MFC-Y17, 11/30/99	Ref. 23, p. 5-6; Ref. 27, p. 6
	TMW-2, MFE-M26, 3/23/99	Ref. 16, p. 48 and 49; Ref. 25, p. 7
Chromium	GMW-5, MFC-Y16, 11/30/99	Ref. 23, p. 4; Ref. 27, p. 6
	GMW-6, MFC-Y17, 11/30/99	Ref. 23, p. 5-6; Ref. 27, p. 6

Source No. 1 – Groundwater Plume (With No Identified Source)
Source Hazardous Substances

Table 1 (Continued)

Hazardous substance	Evidence	
	Sample Designation, ID Number, Date	References
Dichloroethene, cis-1,2-	GMW-1, FGS54, 11/30/99	Ref. 23, p. 6-7; Ref. 26, p. 7
	GMW-2, FDL79, 11/30/99	Ref. 23, p. 2; Ref. 26, p. 7
	GMW-4, FDL81, 11/30/99	Ref. 23, p. 3; Ref. 26, p. 7
	GMW-5, FDL82 and FDL83, 11/30/99	Ref. 23, p. 4; Ref. 26, p. 7
	TMW-2, FDL37, 3/23/99	Ref. 16, p. 48 and 49; Ref. 24, p. 7
Dichloroethene, cis-1,2-	V-1, FDL53, 3/24/99	Ref. 16, p. 59; Ref. 24, p. 9
	W-1, FDL51, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	W-3, FDL52, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	W-6, FDL54, 3/24/99	Ref. 16, p. 60; Ref. 24, p. 9
	W-7A, FDL49 and FDL50, 3/24/99	Ref. 16, p. 57; Ref. 24, p. 9
	W-8, 9/9/99	Ref. 16, p. 72; Ref. 28, p. 1-3
Dichloroethene, trans-1,2-	GMW-5, FDL82 and FDL83, 11/30/99	Ref. 23, p. 4; Ref. 26, p. 7
	W-3, FDL52, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	W-7A, FDL49 and FDL50, 3/24/99	Ref. 16, p. 57; Ref. 24, p. 9
	W-8, 9/9/99	Ref. 16, p. 72; Ref. 28, p. 1-3

Source No. 1 – Groundwater Plume (With No Identified Source)
Source Hazardous Substances

Table 1 (Continued)

Hazardous substance	Evidence	
	Sample Designation, ID Number, Date	Reference
Lead	GMW-5, MFC-Y16, 11/30/99	Ref. 23, p. 4; Ref. 27, p. 6
	GMW-6, MFC-Y17, 11/30/99	Ref. 23, p. 5-6; Ref. 27, p. 6
	TMW-2, MFE-M26, 3/23/99	Ref. 16, p. 48 and 49; Ref. 25, p. 7
Nickel	GMW-5, MFC-Y16, 11/30/99	Ref. 23, p. 4; Ref. 27, p. 6
Tetrachloroethene	CMW-6, FDL44, 3/23/99	Ref. 16, p. 54; Ref. 24, p. 8
	GMW-1, FGS54, 11/30/99	Ref. 23, p. 6-7; Ref. 26, p. 7
	GMW-2, FDL79, 11/30/99	Ref. 23, p. 2; Ref. 26, p. 7
	GMW-3, FDL80, 11/30/99	Ref. 23, p. 2-3; Ref. 26, p. 7
	GMW-4, FDL81, 11/30/99	Ref. 23, p. 3; Ref. 26, p. 7
	GMW-5, FDL82 and FDL83, 11/30/99	Ref. 23, p. 4; Ref. 26, p. 7
	GMW-6, FDL44, 3/23/99	Ref. 16, p. 54; Ref. 24, p. 8
Tetrachloroethene	W-1, FDL51, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	W-3, FDL52, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	W-4, FDL46, 3/23/99	Ref. 16, p. 55; Ref. 24, p. 8
	W-6, FDL54, 3/24/99	Ref. 16, p. 60; Ref. 24, p. 9

Source No. 1 – Groundwater Plume (With No Identified Source)
Source Hazardous Substances

Table 1 (Continued)

Hazardous substance	Evidence	
	Sample Designation, ID Number, Date	Reference
Tetrachloroethene	W-7A, FDL49 and FDL50, 3/24/99	Ref. 16, p. 57; Ref. 24, p. 9
	W-8, 9/9/99	Ref. 16, p. 72; Ref. 28, p. 1-3
Trichloroethene	GMW-1, FGS54, 11/30/99	Ref. 23, p. 6-7; Ref. 26, p. 7
	GMW-2, FDL79, 11/30/99	Ref. 23, p. 2; Ref. 26, p. 7
	GMW-3, FDL80, 11/30/99	Ref. 23, p. 2-3; Ref. 26, p. 7
	GMW-4, FDL81, 11/30/99	Ref. 23, p. 3; Ref. 26, p. 7
	GMW-5, FDL82 and FDL83, 11/30/99	Ref. 23, p. 4; Ref. 26, p. 7
	W-1, FDL51, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	W-3, FDL52, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	W-4, FDL46, 3/23/99	Ref. 16, p. 55; Ref. 24, p. 8
	W-6, FDL54, 3/24/99	Ref. 16, p. 60; Ref. 24, p. 9
	W-7A, FDL49 and FDL50, 3/24/99	Ref. 16, p. 57; Ref. 24, p. 9
	W-8, 9/9/99	Ref. 16, p. 72; Ref. 28, p. 1-3

Source No. 1 – Groundwater Plume (With No Identified Source)
Source Hazardous Substances

Table 1 (Continued)

Hazardous substance	Evidence	
	Sample Designation, ID Number, Date	Reference
Vinyl chloride	W-8, 9/9/99	Ref. 16, p. 72; Ref. 28, p. 1-3
Zinc	GMW-5, MFC-Y16, 11/30/99	Ref. 23, p. 4; Ref. 27, p. 6

Table 2: Monitor Well Construction Details and Static Water Level Elevations for March 1999 and July 2000.

Well ID	Casing Elevation SOS (ft)	Total Depth (ft. bgs)	Screen Interval (ft bgs.)	Well Diameter (inches)	Depth to Water 7/00 (TOC) (ft)	Water Level Elevations 7/00 (ft)	Depth to Water 3/99 (TOC) (ft)	Water Level Elevations 3/99 (ft)	References
W-1	100.61	9	3.5 - 8.5	2	5.86	94.75	5.22	95.39	Ref. 16, p. 58; Ref. 23, p. 26,27; Ref. 56, p. 26
W-2	100	10	4.5 - 9.5	2	5.27	94.73			Ref. 23, p. 26,27; Ref. 56, p. 27
W-3	99.28	8	2.5 - 7.5	2	4.3	94.98	3.78	95.5	Ref. 16, p. 58; Ref. 23, p. 26,27; Ref. 56, p. 28
W-4	99.4	8	2.5 - 7.5	2	4.28	95.12	3.73	95.67	Ref. 6, p. 37; Ref. 16, p. 55; Ref. 23, p. 26,27
W-6	99.64	8	2.5 - 7.5	2	4.99	94.65	4.48	95.16	Ref. 6, p. 39; Ref. 16, p. 59; Ref. 23, p. 26,27
W-7A	100.78	13	2.6 – 12.6	2	6.5	94.28	5.35	95.43	Ref. 15, p. 4;Ref. 16, p. 57; Ref. 23, p. 26,27
W-8	99.81	13	2.8 – 12.8	2	5.41	94.4			Ref. 15, p. 3; Ref. 23, p. 26,27
W-9	100.22	13	3 - 13	2	5.81	94.41			Ref. 15, p. 2; Ref. 23, p. 26,27
V-1	100.21	29	24 - 29	2	5.37	94.84	8.49	91.72	Ref. 6, p. 41; Ref. 16, p. 59; Ref. 23, p. 26,27
MW-6	101.51	13.4	3.1 - 12.8	2	5.86	95.65			Ref. 42, p. 1; Ref. 23, p. 30,31
MW-7	100.97	13.9	3.6 - 13.2	2	4.82	96.15			Ref. 42, p. 1; Ref. 23, p. 30,31
MW-8	101.04	13	2.7 - 12.4	2	5.36	95.68			Ref. 42, p. 1; Ref. 23, p. 30,31

Table 2 (continued): Monitor Well Construction Details and Static Water Level Elevations for March 1999 and July 2000

Well ID	Casing Elevation SOS (ft)	Total Depth (ft. bgs)	Screen Interval (ft bgs.)	Well Diameter (inches)	Depth to Water 7/00 (TOC) (ft)	Water Level Elevations 7/00 (ft)	Depth to Water 3/99 (TOC) (ft)	Water Level Elevations 3/99 (ft)	References
MW-10	100.54	15.74	5.6 - 15.2	2	5.12	95.42	4.67	95.87	Ref. 7, p. 1; Ref. 16, p. 52, 141; Ref. 23, p. 30,31
MW-11	100.44	15.54	5.4 - 15	2	5.53	94.91			Ref. 7, p. 2; Ref. 23, p. 30,31
MW-12	100.15	15.34	4.8 - 14.4	2	5.06	95.09	4.45	95.7	Ref. 7, p. 2; Ref. 16, p. 49; Ref. 23, p. 30,31
TMW-2	100.33	14.26	4.2 - 14.2	2	5.97	94.36	4.73	95.6	Ref. 16, p. 48; Ref 43, p. 1; Ref. 23, p. 30,31
TMW-3	100.02	11.92	1.9 - 11.9	2	5.85	94.17	4.42	95.6	Ref. 16, p. 48, Ref. 43, p. 2; Ref. 23, p. 30,31
CMW-1	104.21	15	2.5 - 15	2	8.7	95.51	8.15	96.06	Ref. 10, p. 20;Ref. 16, p. 53; Ref 23, p. 31, 32
CMW-2	103.1	14.5	2.5 – 14.5	2	7.5	95.6			Ref. 10, p. 21; Ref 23, p. 31, 32
CMW-3		15	5 - 15	2			7.00		Ref. 10, p. 22; Ref. 16, p. 52
CMW-6	101.76	13.8	3.5 – 13.5	2					Ref. 16, p. 54, 141, 142; Ref. 55, p. 1, 3
GMW-1	99.99	47.4	37.4 - 47.4	2	4.21	95.78			Ref. 16, p. 82; Ref. 22, P. 1; Ref. 23, p. 6, 26, 27
GMW-2	99.96	14.8	9.8 - 14.8	2	5.73	94.23			Ref. 16, p. 84; Ref. 22, P. 2; Ref. 23, p. 1, 26, 27
GMW-3	100.7	13.4	8.4 - 13.4	2	6.44	94.26			Ref. 16, p. 85; Ref. 22, P. 3; Ref. 23, p. 2, 29
GMW-4	100.07	13	8 - 13	2	5.39	94.68			Ref. 16, p. 85; Ref. 22, P. 4; Ref. 23, p. 3, 29

Table 2 (continued): Monitor Well Construction Details and Static Water Level Elevations for March 1999 and July 2000

Well ID	Casing Elevation SOS (ft)	Total Depth (ft. bgs)	Screen Interval (ft bgs.)	Well Diameter (inches)	Depth to Water 7/00 (TOC) (ft)	Water Level Elevations 7/00 (ft)	Depth to Water 3/99 (TOC) (ft)	Water Level Elevations 3/99 (ft)	References
GMW-5	100.76	10.3	5.3 - 10.3	2	6.2	94.56			Ref. 16, p. 87; Ref. 22, P. 5; Ref. 23, p. 4, 29
GMW-6	99.76	10.3	5.3 - 10.3	2	4.77	94.99			Ref. 16, p. 88; Ref. 22, P. 6; Ref. 23, p. 5, 29
				Background Wells					
CMW-4	104.25	14.5	2.5 – 14.5	2	8.71	95.54	8.13	96.12	Ref. 10, p. 23; Ref. 16, p. 53; Ref 23, p. 31, 32
CMW-5	100.87	11	0.6 – 10.6	2			4.87	96.00	Ref. 16, p. 54, 141, 142; Ref 55, p. 2, 3
W-5	99.6	8	2.5 - 7.5	2	4.51	95.09	3.98	95.62	Ref. 6, p. 38; Ref. 16, p. 56; Ref. 23, p. 26,27

TOC = Top of Casing

Source No. 1 – Background Source Hazardous Substances

Table 3: Constituents Detected in Background Groundwater Samples

Constituent	Station, Lab Number, Date	Highest Background Concentration [SQL] (ug/L)	3x Highest Background Concentration (ug/L)	Reference
PCE	CMW-4, FDL42, 3/23/99	ND [1]	NA	Ref. 24, p. 8
TCE	CMW-4, FDL42, 3/23/99	ND [1]	NA	Ref. 24, p. 8
Cis-1,2-DCE	CMW-4, FDL42, 3/23/99	ND [1]	NA	Ref. 24, p. 8
Trans-1,2-DCE	CMW-4, FDL42, 3/23/99	ND [1]	NA	Ref. 24, p. 8
1,1-DCE	CMW-4, FDL42, 3/23/99	ND [1]	NA	Ref. 24, p. 8
VC	CMW-4, FDL42, 3/23/99	ND [1]	NA	Ref. 24, p. 8
Nickel	CMW-5, MFE-M33 3/23/99	14.6 L	43.8	Ref. 25, p. 8
Arsenic	CMW-5, MFE-M33 3/23/99	7.9 L	23.7	Ref. 25, p. 8
Beryllium	CMW-5, MFE-M33 3/23/99	0.59 L	1.8	Ref. 25, p. 8
Cadmium	CMW-5, MFE-M33 3/23/99	0.59 L	1.8	Ref. 25, p. 8
Chromium	CMW-5, MFE-M33 3/23/99	10.8	32.4	Ref. 25, p. 8
Lead	W-5, MFE-M35, 3/23/99	11.7 Jv	35.1	Ref. 25, p. 8
Zinc	W-5, MFE-M35, 3/23/99	44.9 Jv	134.7	Ref. 25, p. 8

Notes: ND = Not Detected
NA = Not Applicable
L = Reported concentration is above the IDL and below CRDL
Jv = Estimated Value, low Bias, actual concentration may be higher than the concentration reported
[SQL] = Sample quantitation limits are presented in brackets for the organic substances

The highest concentration of each CERCLA hazardous substance found in the three background monitor wells was used as a background concentration for that substance. A summary of the highest constituent concentrations detected in the background water samples are presented in Table 3.

All samples were collected according to the EPA approved state Quality Assurance Plan and sample locations were approved by the EPA prior to sample collection (Ref. 57, p. 16-28).

2.2.3 Hazardous Substances Available to a Pathway

An observed release to the Groundwater Migration Pathway, Source 1 (Groundwater Plume with no identified source), was based on chemical analyses of groundwater samples from the shallow alluvial aquifer at the site. Section 2.3 of the HRS rule states that an observed release is established as follows:

- If the background concentration is not detected (or is less than the detection limit), an observed release is established when the sample measurement equals or exceeds the sample quantitation limit (Ref. 1, p. 51589).
- If the background concentration equals or exceeds the detection limit, an observed release is established when the sample measurement is 3 times or more above the background concentration (Ref. 1, p. 51589).

Hazardous substances associated with Source 1 that have been found at levels that meet the criteria for observed release include PCE; TCE; c,t-1,2-DCE; 1,1-DCE, VC, arsenic, beryllium, cadmium, chromium, lead, nickel, and zinc (Ref. 1, p. 51595).

2.3 Likelihood of Release

Refer to Section 3.1.1 of this document for specific information related to groundwater samples that meet the criteria for observed release.

2.4 Waste Characteristics

Specific factors related to waste characteristics associated with Source 1, Groundwater Plume (with no identified source), are presented below.

2.4.1 Selection of Substances Potentially Posing Greatest Threat

Vinyl Chloride was selected as the hazardous substance potentially posing the greatest hazard for the groundwater migration pathway. This substance has been found to meet the observed release criteria for the groundwater migration pathway. Vinyl Chloride also has one of the highest combined toxicity/mobility values of all the hazardous substances present in groundwater at the site (Ref 2, p. BI-12). Refer to Section 3.2.1 of this document for specific information related to the toxicity/mobility values assigned to hazardous substances observed in groundwater at the site.

2.4.2 Hazardous Waste Quantity

2.4.2.1.1. Hazardous Constituent Quantity

2.4.2.1.1. Hazardous Constituent Quantity (Tier A) - Not Evaluated (NE)

The information available is not sufficient to evaluate Tier A, as required in Section 2.4.2.1.1 of the HRS Rule. As a result, the evaluation of Hazardous Waste Quantity proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, p. 51591).

2.4.2.1.2. Hazardous Wastestream Quantity (Tier B) - NE

The information available is not sufficient to evaluate Tier B, as required in Section 2.4.2.1.2 of the HRS Rule. As a result the evaluation of Hazardous Waste Quantity proceeds to the evaluation of Tier C, volume (Ref. 1, p. 51591).

2.4.2.1.3. Volume (Tier C)

The volume of the groundwater plume was determined from the geographical coordinates and screened intervals of monitor wells that establish an observed release to groundwater. Only the saturated portion of the screened interval at each monitor well was used for the volume calculation. All of the monitor wells for which there is an observed release, except for two (GMW-01 and V-1), are completed less than 15 feet below ground surface. To simplify the model and make it more conservative, monitor wells GMW-01 and V-1 were not used for the volume calculation. Table 4 displays the 13 monitor wells that were used.

Geographical coordinates used for monitor well locations were acquired using a Geographical Positioning System (GPS) unit on April 4, 2002 (Ref. 16, p. 144, 145; Ref. 58, p. 4). The data acquired by the GPS unit was differentially corrected to obtain precision of less than 2 meters for each location (Ref. 58, p. 4). Table 4 displays the easting and northing coordinates as units of feet in US State Plane 1927 coordinate system.

The “top of casing” elevation of each monitor well was acquired by NMED personnel on July 7, 2000 and March 7, 2002 (Ref. 16, p. 141; Ref. 23, p. 26-32). The top of the casing elevation for monitor well W-2 was arbitrarily set at 100 feet and all other well elevations were indexed to that well. An auto-level and stadia rod were used survey monitor well elevations to within 0.01 ft. Static water level elevations were then measured from the top of the casing at each well using an electronic water level meter (Ref. 16, p. 142).

Static groundwater elevations were collected from each well on March 7, 2002 (Ref. 16, p. 142). The vertical thickness of the plume was determined from the saturated portion of the screened interval at each monitor well. If the static water level elevation of any one monitor well was less than the “top of screen” elevation, than the static water level elevation was used for the “top elevation” of the plume. If the static water level was greater than the “top of screen” elevation, than the top of the screen was used for the “top elevation” of the

plume. The “bottom screen elevation” was used for the “bottom elevation” of the plume at each monitor well location.

The plume volume was generated by the EPA Region 6 GIS Support Group (Ref. 59). ESRI ArcView 3.2 and ESRI ArcScene software were used for the calculations (Ref. 59, p. 1-6). Six grids using three different cell sizes were created using the easting and northing coordinates and top and bottom elevations for each well that were supplied by NMED. Two calculation methods were used to determine the volume between the top and bottom of the grids. This process provided 9 volume totals ranging from 705,177 cubic feet to 726,834 cubic feet (Ref. 59, p. 1).

The smallest volume generated by the modeling (705,177 cubic feet) was chosen as the most conservative estimate for the purposes of scoring the site. This volume was then converted from cubic feet to cubic yards to yield a plume volume of 26,091 cubic yards (1 cubic foot = 0.037 cubic yards). The Source Hazardous Waste Quantity Value for a source type of “other” and a volume of 26,091 cubic yards is 10,436.4 (Ref. 1, p 51591).

2.4.2.1.4. Area (Tier D) – NE

The area measure (tier D) cannot be evaluated because the hazardous waste quantity table (HRS Table 2-5) evaluation does not provide a divisor for a source type “other” in this tier (Ref. 1, p. 51591; Ref. 74, p. 4).

Table 4: Coordinates and Elevations used for the Source 1 Plume Volume Calculation. Northing and Easting Coordinates given as feet in U.S. Sate Plane 1927 *.

Well ID	Easting	Northing	Top of Casing Elevation (ft)	Top of Screen (ft bgs.)	Top of Screen (Elev) (ft)	Bottom of Screen (Ft. BGS)	Bottom of Screen (Elev) (ft)	Depth to Water 3/7/02 (TOC) (ft)	Water Level Elevation 7/00 (ft)	Top of Plume Elevation (ft)	Bottom of Plume Elevation (ft)	References
W-1	496719.087	1511930.669	100.61	3.3	97.31	8.3	92.31	5.92	94.69	94.69	92.31	Ref. 16, p. 58, 142; Ref. 23, p. 26; Ref. 56, p. 26; Ref 58, p. 3,4
W-3	496692.201	1512000.27	99.28	2.5	96.78	7.5	91.78	4.26	95.02	95.02	91.78	Ref. 16, p. 142; Ref. 23, p. 26; Ref. 56, p. 28; Ref 58, p. 3,4
W-4	496637.433	1512012.382	99.4	2.5	96.9	7.5	91.9	4.22	95.18	95.18	91.9	Ref. 6, p. 37; Ref. 16, p. 142; Ref. 23, p. 26; Ref 58, p. 3,4
W-6	496820.514	1512033.083	99.64	2.5	97.14	7.5	92.14	4.86	94.78	94.78	92.14	Ref. 6, p. 39; Ref. 16, p. 142; Ref. 23, p. 26; Ref 58, p. 3,4
W-7A	496684.845	1511854.732	100.78	2.6	98.18	12.6	88.18	5.88	94.9	94.9	88.18	Ref. 15, p. 4; Ref. 16, p. 57, 142; Ref. 23, 26; Ref 58, p. 3,4
W-8	496873.073	1511952.702	99.81	2.8	97.01	12.8	87.01	5.19	94.62	94.62	87.01	Ref. 15, p. 3; Ref. 16, p. 72, 142; Ref 23, p. 26; Ref 58, p. 3,4

Table 4 (continued): Coordinates and Elevations used for the Source 1 Plume Volume Calculation. Northing and Easting Coordinates given as feet in U.S. Sate Plane 1927 *.

Well ID	Easting	Northing	Top of Casing Elevation (ft)	Top of Screen (ft bgs.)	Top of Screen (Elev) (ft)	Bottom of Screen (Ft. BGS)	Bottom of Screen (Elev)	Depth to Water 3/7/02 (TOC)	Water Level Elevation 7/00 (ft)	Top of Plume Elevation (ft)	Bottom of Plume Elevation (ft)	References
TMW-2	496614.85	1511692.035	100.33	4.2	96.13	14.2	86.13	5.46	94.87	94.87	86.13	Ref. 16, p. 48, 142; Ref. 43, p. 1; Ref. 23, p. 31; Ref 58, p. 3,4
CMW-6	496410.537	1511936.059	101.76	3.5	98.26	13.5	88.26	6.23	95.53	95.53	88.26	Ref. 16, p. 54, 141, 142; Ref. 55, p. 1,3; Ref 58, p. 3,4
GMW-2	496933.826	1511917.782	99.96	9.8	90.16	14.8	85.16	5.4	94.56	90.16	85.16	Ref. 16, p. 84, 142; Ref. 22, p. 2; Ref. 23, p. 1, 26; Ref 58, p. 3,4
GMW-3	497097.01	1512038.72	100.7	8.4	92.3	13.4	87.3	6.17	94.53	92.3	87.3	Ref. 16, p. 85, 142; Ref. 22, p. 3; Ref. 23, p. 2, 29; Ref 58, p. 3,4
GMW-4	497027.106	1512280.672	100.07	8	92.07	13	87.07	5.28	94.79	92.07	87.07	Ref. 16, p. 85, 142; Ref. 22, p. 4; ref. 23, p. 3, 29; Ref 58, p. 3,4
GMW-5	496917.354	1512115.888	100.76	5.3	95.46	10.3	90.46	6.02	94.74	94.74	90.46	Ref. 16, p. 87, 142; Ref. 22, p. 5; Ref. 23, p. 4, 29; Ref 58, p. 3,4

Table 4 (continued): Coordinates and Elevations used for the Source 1 Plume Volume Calculation. Northing and Easting Coordinates given as feet in U.S. Sate Plane 1927 *.

Well ID	Easting	Northing	Top of Casing Elevation (ft)	Top of Screen (ft bgs.)	Top of Screen (Elev) (ft)	Bottom of Screen (Ft. BGS)	Bottom of Screen (Elev) (ft)	Depth to Water 3/7/02 (TOC) (ft)	Water Level Elevation 7/00 (ft)	Top of Plume Elevation (ft)	Bottom of Plume Elevation (ft)	References
GMW-6	496845.218	1512251.723	99.76	5.3	94.46	10.3	89.46	4.7	95.06	94.46	89.46	Ref. 16, p. 88, 142; ref. 22, p. 6; ref. 23, p. 5, 29; Ref 58, p. 3,4

* NOTE: The values assigned for the bottom of the screen in feet below the ground surface were obtained from the well logs and measured values of the total depth of each well that had been measured in the field during sampling. For each well, the more conservative of the two values (i.e. smaller value) was used in this table for the volume calculation. For example, if a well log indicated that the total depth of a well was 15 feet below ground surface, but the measurement in the field indicated that the well was only 14 feet deep, the value of 14 feet was used for this table. This would give the most conservative estimate of the volume calculation.

2.4.2.1.4. Area (Tier D)-NE

Tier D was not evaluated.

2.4.2.1.5. Source Hazardous Waste Quantity Value

As described in the HRS Rule, the highest value assigned to a source from among the four tiers of hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), volume (Tier C), and area (Tier D), shall be selected as the source hazardous waste quantity value (Ref. 1, p. 51590 and 51591).

Source No. 1 – Groundwater Plume (with no identified source)

Table 5: Source Hazardous Waste Quantity

Tier Measure	Migration Pathway (Groundwater)
Tier A, Constituent Quantity	NE
Tier B, Wastestream Quantity	NE
Tier C, Volume	10,436.4
Tier D, Area	NE

Source Hazardous Waste Quantity Value: 10,436.4

Table 6: SITE SUMMARY OF SOURCE DESCRIPTIONS

Source No.	Source Hazardous Waste Quantity Value	Containment			
		Ground Water	Surface Water	Gas	Air Particulate
1	10,436.4	10	Not Evaluated	Not Evaluated	Not Evaluated

According to Table 2-6 in Section 2.4.2.2 of the HRS Rule, a hazardous waste quantity factor value of 10,000 was assigned to the groundwater plume (Ref. 1, p. 51591).

Source Hazardous Waste Quantity Value: 10,436.4

Hazardous Waste Quantity Factor Value: 10,000

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Aquifer/Stratum 1

Aquifer/Stratum Name: Quaternary Sediments

Type of Aquifer: Other than Karst

Description:
Borehole logs for monitor wells drilled in the source area indicate that the near-surface lithology at the site mainly consists of silts, clays, silty sands and some interbedded sands and gravels (Ref. 6, p. 28-36; Ref. 7, p. 7-12; Ref. 8, p. 23-28; Ref. 10, p. 20-25; Ref. 15, p. 2-7; Ref. 22, p. 1-6; Ref. 42, p. 5-10; Ref. 43, p. 3-8; Ref. 55, p. 1-2; Ref. 56, p. 20-24). GMW-01, the deepest borehole drilled at the site is 47.5 feet bgs (Ref. 22, p. 1). The borehole log shows silts and clays from 0 to 43 feet bgs with sand and some gravel from 43 to 50 feet bgs (Ref. 22, p. 1).

It is unknown if the shallow alluvial sediments at the site are hydraulically connected to the lower San Andres/Glorieta Aquifer, which is principal aquifer for the Grants area (Ref. 39, p. 220). Wells logs from municipal wells located within two miles of the plume indicate that there may be other clay layers at depths below 50 feet at the site (Ref. 41, p. 1-4).

There is some evidence that suggests that the silt and clay layers encountered in monitor wells at the site, do not extend to all areas within a two mile radius of the site. There are two geologic features exposed at the surface within two miles of the site. Black Mesa is located a mile and a half to the northwest of the site (Figure 4) (Ref. 4, Grants Quadrangle 7.5-minute map). This mesa rises more than 500 feet in elevation above the site elevation and consists of volcanic capped Jurassic aged sandstones and limestones (Ref. 40, Geologic Map of Cibola County). The Malpais Volcanic Field, which consists of Quaternary aged basalt flows, is located ½ mile to the south of the site (Figure 4) (Ref. 4, Grants Quadrangle 7.5-minute map; Ref. 64, p. 37-40). A domestic well log (B-608) within two miles of the site and adjacent to the lava field indicates that the Malpais Basalts are about 50 feet thick near the site (Ref. 16, p. 133).

The discontinuation of the silts and clays at some lateral distance from the site might allow for deeper hydrologic units to become hydraulically connected to contaminated units at the site.

Since both Black Mesa and the Malpais Volcanic field are younger in age than the Permian aged San Andres/Glorieta aquifer, they lay stratigraphicaly above the San Andres/Glorieta and do not act as a hydraulic barrier to the aquifer.

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer/Stratum 1 – Quaternary Sediments

The quaternary sediments are not being evaluated as an aquifer for the site HRS Score. There were no receptors found for this stratum, thus the HRS score would be negligible. It is also not known if this unit is hydraulically connected to the deeper San Andres/Glorieta Aquifer, which is the principal aquifer for the area (Ref. 39, p. 220).

There is an observed release to groundwater in this stratum. Evidence for this observed release is described below.

Chemical Analysis:

The groundwater plume source contains "hazardous substances" for which an observed release was established within the shallow groundwater at the site. The hazardous substances listed below in Table 7 were detected in samples collected by the New Mexico Environment Department (NMED) in 1999 and 2000 during the SI investigation (Ref. 16, p. 48-56, 72-74; Ref. 23, p. 1-10).

Fifteen monitor wells were found to contain concentrations of chlorinated solvents. Chlorinated solvents detected in groundwater at the site include PCE; TCE; c,t-1,2-DCE; 1,1-DCE, and VC (Ref. 24, p. 7-9; Ref. 26, p. 7; Ref. 28, p. 2,3,5,6; Ref. 29, p. 8,9). The highest concentration of PCE in groundwater at the site was encountered in GMW-6 at 26,000 ug/L (Ref. 26, p. 7). Monitor well W-6 had the highest concentrations of TCE and cis-1,2-DCE at 6500 ug/L and 2400 ug/L respectively (Ref. 24, p. 9). Monitor well W-8 had the highest concentration of trans-1,2-DCE at 55 ug/l (Ref. 28, p. 3). W-8 was also the only well where VC or 1,1-DCE was detected in groundwater (Ref. 29, p. 8-9). VC was detected at 42 ug/L. 1,1-DCE was detected at 6 ug/L (Ref. 29, p. 8-9).

An observed release was also established for several inorganic CERCLA hazardous substances. These include arsenic, beryllium, cadmium, chromium, lead, nickel, and zinc (Ref. 25, p. 7-9 Ref. 27, p. 6). Arsenic was significantly above background concentrations in monitor wells TMW-2, MW-12, W-7, and GMW-5 (Ref. 25, p. 7-8; Ref. 27, p. 6). Beryllium was significantly above background in MW-12, GMW-3, and GMW-5 (Ref. 25, p. 7; Ref. 27, p. 6). TMW-2 and GMW-5 were above background concentrations for cadmium (Ref. 25, p. 7; Ref. 27, p. 6). GMW-5 and GMW-6 were above background concentrations for chromium (Ref. 27, p. 6). Lead was significantly above background in monitor wells TMW-2, GMW-5 and GMW-6 (Ref. 25, p. 7; Ref. 27, p. 6). GMW-5 also was above background concentrations nickel and zinc (Ref. 27, p. 6).

Background Samples:

For the purposes of HRS scoring, three monitor wells have been designated as the background groundwater sampling locations. These are monitor wells CMW-4, CMW-5, and W-5. All three monitor wells were sampled during the March 1999 sampling event for the SI (Ref. 16, p. 48-56). These wells were chosen as background wells because they are hydraulically up gradient from the Grants Chlorinated Solvents Plume (see Figures 5 and 6, Groundwater Contour Maps for Water Level Measurements in March 1999 and July 2000), are screened at similar depths to most of the monitor wells that define the plume area (see Table 2, Monitor Well Construction Details and Groundwater Surface Elevations), and did not show any contamination of chlorinated solvents (Ref. 24, p. 8). Locations of these background monitor wells can be found in Figures 2, 5, and 6.

The highest concentration of each substance found in the three background monitor wells was used as a background concentration for that substance. A summary of the highest constituent concentrations detected in the background water samples are presented in Table 3.

Contaminated Samples:

The following groundwater wells listed in Table 7 have been documented to be contaminated with hazardous substances associated with the groundwater plume with no identified source. The well locations can be found in Figures 2 and 3.

Table 7: Contaminated Groundwater Wells and Hazardous Substances

Hazardous substance	Concentration (ug/L)	Evidence	
		Well ID, Sample Number, Date	Reference
Arsenic	26.8	GMW-5, MFC-Y16, 11/30/99	Ref. 23, p. 4; Ref. 27, p. 6
	28.2	TMW-2, MFE-M26, 3/23/99	Ref. 16, p. 48 and 49; Ref. 25, p. 7
	29.9	W-7A, MFE-M37, 3/24/99	Ref. 16, p. 57; Ref. 25, p. 8
Beryllium	2.7 L	GMW-3, MFC-Y13, 11/30/99	Ref. 23, p. 2-3; Ref. 27, p. 6
	3 L	GMW-4, MFC-Y14, 11/30/99	Ref. 23, p. 3; Ref. 27, p. 6
	6.6	GMW-5, MFC-Y16, 11/30/99	Ref. 23, p. 5; Ref. 27, p. 6
	3.6 L	GMW-6, MFC-Y17, 11/30/99	Ref. 23, p. 5-6; Ref. 27, p. 6
Cadmium	4.3 L	GMW-5, MFC-Y16, 11/30/99	Ref. 23, p. 5; Ref. 27, p. 6
	3.2 L	TMW-2, MFE-M26, 3/23/99	Ref. 16, p. 48 and 49; Ref. 25, p. 7
Chromium	104	GMW-5, MFC-Y15, 11/30/99	Ref. 23, p. 5; Ref. 27, p. 6
	49.4	GMW-6, MFC-Y17, 11/30/99	Ref. 23, p. 5-6; Ref. 27, p. 6
Dichloroethene, 1,1-	6	W-8, FGG14, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 8
	4	W-8, FGG15, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 9

Table 7 (Continued): Contaminated Groundwater Wells and Hazardous Substances

Hazardous substance	Concentration (ug/L)	Evidence	
		Sample Designation, ID Number, Date	Ref.
Dichloroethene, cis-1,2-	11	GMW-1, FGG13, 4/17/00	Ref. 23, p. 9; Ref. 29, p. 8
	7	GMW-1, FGS54, 11/30/99	Ref. 23, p. 6-7; Ref. 26, p. 7
	930	GMW-2, FDL79, 11/30/99	Ref. 23, p. 2; Ref. 26, p. 7
	6 LJ	GMW-4, FDL81, 11/30/99	Ref. 23, p. 3; Ref. 26, p. 7
	190	GMW-5, FDL82, 11/30/99	Ref. 23, p. 4; Ref. 26, p. 7
	280	GMW-5, FDL83, 11/30/99	Ref. 23, p. 4; Ref. 26, p. 7
	5	TMW-2, FDL37, 3/23/99	Ref. 16, p. 48 and 49; Ref. 24, p. 7
	44	V-1, FDL53, 3/24/99	Ref. 16, p. 59; Ref. 24, p. 9
	240	W-1, FDL51, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	43	W-3, FDL52, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	2400	W-6, FDL54, 3/24/99	Ref. 16, p. 60; Ref. 24, p. 9
	17	W-7A, FDL49, 3/24/99	Ref. 16, p. 57; Ref. 24, p. 9
	16 LJ	W-7A, FDL50, 3/24/99	Ref. 16, p. 57; Ref. 24, p. 9
	815	W-8, 9/9/99	Ref. 16, p. 72; Ref. 28, p. 1-3
	730	W-8, FGG14, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 8 and 9
	690	W-8, FGG15, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 8 and 9

Table 7 (Continued): Contaminated Groundwater Wells and Hazardous Substances

Hazardous substance	Concentration (ug/L)	Evidence	
		Sample Designation, ID Number, Date	Reference
Dichloroethene, trans-1,2-	36 LJ	GMW-5, FDL82 and FDL83, 11/30/99	Ref. 23, p. 4; Ref. 26, p. 7
	4	W-3, FDL52, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	6	W-7A, FDL49 and FDL50, 3/24/99	Ref. 16, p. 57; Ref. 24, p. 9
	55	W-8, 9/9/99	Ref. 16, p. 72; Ref. 28, p. 1-3
	48	W-8, FGG14, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 8
	50	W-8, FGG15, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 9
Lead	56.5	GMW-5, MFC-Y16, 11/30/99	Ref. 23, p. 4; Ref. 27, p. 6
	39.8	GMW-6, MFC-Y17, 11/30/99	Ref. 23, p. 5-6; Ref. 27, p. 6
	36.3	TMW-2, MFE-M26, 3/23/99	Ref. 16, p. 48 and 49; Ref. 25, p. 7
Nickel	74.1	GMW-5, MFC-Y15, 11/30/99	Ref. 23, p. 4; Ref. 27, p. 6
Tetrachloroethene	4	CMW-6, FDL44, 3/23/99	Ref. 16, p. 54; Ref. 24, p. 8
	11	GMW-1, FGG13, 4/17/00	Ref. 23, p. 9; Ref. 29, p. 8
	32	GMW-1, FGS54, 11/30/99	Ref. 23, p. 6-7; Ref. 26, p. 7
	3000	GMW-2, FDL79, 11/30/99	Ref. 23, p. 2; Ref. 26, p. 7
	3100	GMW-3, FDL80, 11/30/99	Ref. 23, p. 2-3; Ref. 26, p. 7
	38	GMW-4, FDL81, 11/30/99	Ref. 23, p. 3; Ref. 26, p. 7
	340 Jv	GMW-5, FDL82, 11/30/99	Ref. 23, p. 4; Ref. 26, p. 7
	620 j^	GMW-5, FDL83, 11/30/99	Ref. 23, p. 4; Ref. 26, p. 7

Table 7 (Continued): Contaminated Groundwater Wells and Hazardous Substances

Hazardous substance	Concentration (ug/L)	Evidence	
		Sample Designation, ID Number, Date	Reference
Tetrachloroethene	26,000	GMW-6, FDL84, 3/23/99	Ref. 23, p. 5-6; Ref. 26, p. 7
	280	W-1, FDL51, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	44	W-3, FDL52, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	10	W-4, FDL46, 3/23/99	Ref. 16, p. 55; Ref. 24, p. 8
	9,800	W-6, FDL54, 3/24/99	Ref. 16, p. 60; Ref. 24, p. 9
	360	W-7A, FDL49, 3/24/99	Ref. 16, p. 57; Ref. 24, p. 9
	380	W-7A, FDL50, 3/24/99	Ref. 16, p. 57; Ref. 24, p. 9
	603	W-8, 9/9/99	Ref. 16, p. 72; Ref. 28, p. 1-3
	820	W-8, FGG14, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 8
	690	W-8, FGG15, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 9
Trichloroethene	55	GMW-1, FGG13, 4/17/00	Ref. 23, p. 9; Ref. 29, p. 8
	79	GMW-1, FGS54, 11/30/99	Ref. 23, p. 6-7; Ref. 26, p. 7
	2,000	GMW-2, FDL79, 11/30/99	Ref. 23, p. 2; Ref. 26, p. 7
	260 LJ	GMW-3, FDL80, 11/30/99	Ref. 23, p. 2-3; Ref. 26, p. 7
	65	GMW-4, FDL81, 11/30/99	Ref. 23, p. 3; Ref. 26, p. 7
	270 Jv	GMW-5, FDL82, 11/30/99	Ref. 23, p. 4; Ref. 26, p. 7

Table 7 (Continued): Contaminated Groundwater Wells and Hazardous Substances

Hazardous substance	Concentration (ug/L)	Evidence	
		Sample Designation, ID Number, Date	Reference
Trichloroethene	460 J^	GMW-5, FDL83, 11/30/99	Ref. 23, p. 4; Ref. 26, p. 7
	420	W-1, FDL51, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	35	W-3, FDL52, 3/24/99	Ref. 16, p. 58; Ref. 24, p. 9
	15	W-4, FDL46, 3/23/99	Ref. 16, p. 55; Ref. 24, p. 8
	6,500	W-6, FDL54, 3/24/99	Ref. 16, p. 60; Ref. 24, p. 9
	64	W-7A, FDL49, 3/24/99	Ref. 16, p. 57; Ref. 24, p. 9
	62	W-7A, FDL50, 3/24/99	Ref. 16, p. 57; Ref. 24, p. 9
	1,680	W-8, 9/9/99	Ref. 16, p. 72; Ref. 28, p. 1-3
	1,500	W-8, FGG14, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 8
	1,300	W-8, FGG15, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 9
Vinyl chloride	34	W-8, 9/9/99	Ref. 16, p. 72; Ref. 28, p. 1-3
	42	W-8, FGG14, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 8
	28 J	W-8, FGG15, 4/17/00	Ref. 23, p. 9 and 10; Ref. 29, p. 9
Zinc	251	GMW-5, MFC-Y15, 11/30/99	Ref. 23, p. 4; Ref. 27, p. 6

Notes:
L = Reported concentration is above the IDL and below CRDL
J = Estimated Value
^ = High bias. Actual concentration may be lower than the concentration reported
v = low bias. Actual concentration may be higher than the concentration reported

Observed Release:

An observed release has been documented to the groundwater pathway from the water wells identified in Table 7 above by chemical analysis as defined by the HRS Rule (Ref. 1, p. 51589, Table 2-3).

Attribution:

The SI investigation of the Grants Chlorinated Solvents Plume suggested several potential source areas near the groundwater plume (Ref. 53, p. 6-8).

Although, no one facility was clearly identified as the source of the contamination, several potential sources were investigated and/or identified. Previous investigations have suggested several potential source areas including primarily Holiday Cleaners(Ref. 16, p. 99, 117, 118; Ref. 33, p. 1; Ref. 53, p. 6,7), R&L Laundry (Ref. 16, p. 124-126, Ref. 53, p. 8), an abandoned dry cleaning facility at 605 First Street (Ref. 16, p. 75, 76, 79, 116, 117; Ref. 53, p. 8), and a former Mountain States Telephone and Telegraph Company facility (Ref. 16, p. 39, 124; Ref. 32, p. 1; Ref. 53, p. 7-8).

Adequate documentation attributing the hazardous substances to one or more of the potential source areas has not been identified according to the HRS criteria. A groundwater plume with no identified source was used for HRS scoring. The groundwater plume with no identified source was characterized as the site source based on the following:

- The plume was established solely by sampling, using the criteria for an observed release to the Groundwater Migration Pathway (see Table 7).

- The level of effort to identify the original source(s) of the hazardous substances was a “Site Inspection” (SI) Report dated April 2001 (Ref. 53).

Hazardous Substances Released:

The CERCLA hazardous substances used to establish an observed release to the Groundwater Migration Pathway are PCE; TCE; c,t-1,2-DCE; 1,1-DCE, VC, arsenic, beryllium, cadmium, chromium, lead, nickel, and zinc.

Aquifer/Stratum 2

Aquifer/Stratum Name: San Andres/Glorieta

Type of Aquifer: Karst

The principal source of potable groundwater in west-central New Mexico is the San Andres-Glorieta aquifer system (Ref. 60, p. 331; Ref. 61, p. 30). The City of Grants is located in the Bluewater Groundwater Basin (Ref. 63). The San Andres Limestone and the underlying Glorieta Sandstone together form the principle aquifer for much of the Bluewater Basin (Ref. 39, p. 220).

The Glorieta Sandstone and San Andres Limestone with interbedded sandstone are hydraulically connected and act as a single hydrologic unit (Ref. 60, p. 331; Ref. 61, p. 30; Ref. 62, p. 8). This stratigraphic sequence is commonly referred to as the "San Andres-Glorieta aquifer system" (Ref. 60, p. 331).

The City of Grants has two municipal wells, B-38 and B-40, which withdraw water from the San Andreas and Glorieta formations (Ref. 36, p. 1; Ref. 41). The well casing in B-40 was perforated in both formations (Ref. 41, p. 3). Well B-38 was left as an open borehole from 149 feet below ground surface to the total depth at 300 feet (Ref. 41, p. 1). Section 3.0.1.2.1 of the HRS Rule states to evaluate whether aquifer interconnections occur within two miles of the sources at the site (Ref. 1, p. 51595). If they occur within this 2-mile distance, combine the aquifer having interconnections in scoring the site (Ref. 1, p. 51595). The San Andreas and Glorieta aquifers are being scored as one aquifer because of the literature citations that suggest their hydraulic connection, and due to the grants municipal well interconnections that are within two miles of the site (see Figure 4).

In the Grants area, the Glorieta Sandstone consists of about 86 to 300 feet of massive, well-sorted, fine to medium-grained sandstone (Ref. 40, p.15). The San Andres Limestone ranges from 80 to 150 feet in thickness and varies in lithology (Ref. 40, p. 16). Three units form the San Andres. There is a lower massive limestone that may contain interbedded sandstone and limestone, a middle medium grained sandstone, and an upper massive fossiliferous limestone (Ref. 40, p. 16). Grants Municipal Well #1 (B-38) is at approximately the same elevation as the site (Figure 4) (Ref. 4, USGS Grants Quadrangle). A drilling log for this well indicates that the San Andres is less than 200 feet bgs in that area (Ref. 41, p. 1-2).

Most of the water in the San Andres-Glorieta aquifer is transmitted in solution channels, cavernous zones, and fractures in the San Andres Limestone (Ref. 61, p. 1, 31; Ref. 62, p. 8). A period of erosion at the Permian-Triassic contact exposed the San Andres Limestone to extensive solution action and erosion in the Grants area, resulting in the development of karst topography (Ref. 40, p. 16). Solution channels and cavernous zones have developed in the San Andres, so that transmissivity of the limestone is high at most places (Ref. 39, p. 220; Ref. 61, p. 34, Ref. 62, p. 14,15). In the Grants area, solution channels and

cavernous zones are generally well connected (Ref. 61, p. 1, 31; Ref. 64, p. 29). Hydraulic gradients are less than a foot per mile near Grants, indicating that the aquifer is highly transmissive and that water moves through the aquifer with little loss of head (Ref. 61, p. 34). Zones of transmissivity of 50,000 feet squared per day are located in the Grants area (Ref. 61, p. 1, Ref. 62, p. 77). The U.S. Geological Survey considered the Grants area to be in a zone of cavernous limestone when building a Hydrogeologic model of the San Andres-Glorieta Aquifer (Ref. 62, p. 77,78,80, and 81).

South and southeast of Grants, cavernous zones in the San Andres Limestone also have been penetrated in oil- and hydraulic-test wells (Ref. 60, p. 332; Ref. 61, p. 19). A drilling log from a domestic well (B-1368) about three miles west of the site indicated that a cavern was encountered in the San Andres at 130 feet bgs (Ref. 16, p. 135).

The San Andres/Glorieta Aquifer is the aquifer being evaluated. There has not been an observed release in this aquifer attributable to the Grants Chlorinated Solvents Plume Site. According to Section 3.1.1 of the HRS Rule if an observed release cannot be established for the aquifer, assign an observed release factor value of 0 (Ref. 1, p. 51595).

Groundwater Observed Release Factor Value: 0

3.1.2 POTENTIAL TO RELEASE

As specified in the HRS Rule, since an observed release could not be established in the San Andres/Glorieta Aquifer, the aquifer will be evaluated as potential to release (Ref. 1, p. 51595). Potential to release will be evaluated on four factors: containment, net precipitation, depth to aquifer, and travel time.

3.1.2.1 Containment

Table 8 Containment Factor Value

Source No.	Source Name	Descriptor	Value
1	Groundwater Plume	All sources (Except surface impoundments, Land Treatment, Containers, and Tanks) **No Liner** (Ref. 1, Table 3-2, p. 51596)	10

Containment Factor Value: 10

3.1.2.2 Net Precipitation

As specified in the Section 3.1.2.2 and Figure 3-2 of the HRS Rule, a net precipitation factor value of 1 was assigned based on the site location (Ref. 1, p. 51596, 51598, 51600).

Net Precipitation Factor Value: 1

3.1.2.3 Depth to Aquifer

As specified in Section 3.1.2.3 of the HRS Rule, measure the depth of an aquifer as the distance from the surface to the top of the aquifer minus the distance from the surface to the lowest known point of hazardous substance eligible to be evaluated for that aquifer (Ref. 1, p 51600). Determine the Depth to Aquifer only at locations within two miles of the site, except: if observed groundwater contamination attributable to sources at the site extends more than two miles beyond these sources (Ref. 1, p. 51600)

The depth to the San Andres/Glorieta aquifer was determined from Grants Municipal Well #1 (B-38). Well B-38 is located approximately 1-¾ miles west of the site (Figure 4). The ground surface at this well location is at approximately the same elevation as the site (Figure 4) (Ref. 4, USGS Grants Quadrangle). The drilling log for this well indicates that "Lime Rock" of the San Andres Limestone was first encountered at 140 feet below ground surface in that area (Ref. 40, p. 15-16; Ref. 41, p. 1-2). The drilling log shows that interbedded limestone and sandstones typical of the San Andres formation were encountered to a depth of 241 feet (Ref. 41, p. 2). At 241 feet, the white sandstone indicating the top of the Glorieta formation was encountered (Ref. 40, p. 15-16; Ref. 41, p. 2).

The lowest known point of hazardous substance at the Grants Chlorinated Solvents Plume Site was detected in monitor well GMW-1 (Ref. 26, p. 7; Ref. 29, p. 8). This well was sampled on November 30, 1999 and again on April 17, 2000 (Ref. 23, p. 6-9). The highest concentrations of PCE, TCE and cis-1,2-DCE detected in groundwater at GMW-1 was 32 ug/L, 79 ug/L and 11 ug/L respectively (Ref. 26, p. 7; Ref. 29, p. 8) . The lowest known point of hazardous substance as defined by monitor well GMW-1 will be set at the top of the screened interval for this well. The top of the screened interval is 37 feet below ground surface (Ref. 16, p.81-83; Ref. 22, p. 1).

Considering that the San Andres/Glorieta Aquifer is at 140 feet below ground surface 1¾ miles from the site, and the lowest known point of hazardous substance is 37 feet below ground surface, an estimate of 103 feet to the depth of the aquifer was determined.

Table 9: Depth to Aquifer

Location	Stratum	Depth(in feet) (Top of Stratum)	Reference
Grants Chlorinated Solvents Plume	San Andres/ Glorieta	25 -250	Ref. 39, p. 220; Ref. 40, p. 15-16, 43

Table 3-5 in Section 3.1.2.3 of the HRS Rule indicates that an aquifer that has a depth between 25 feet and 250 feet is assigned a Depth to Aquifer Factor Value of 3 (Ref. 1, 51600).

Depth to Aquifer Factor Value: 3

3.1.2.4 Travel Time

Section 3.1.2.4 of the HRS Rules specifies to evaluate the travel time based on the geologic materials in the interval between the lowest known point of hazardous substances at the site and the top of the aquifer being evaluated. Determine travel time only at locations within two miles of the site, except: if observed groundwater contamination attributable to sources at the site extends more than two miles beyond these sources. Select the lowest hydraulic conductivity layer(s) from within the above interval (Ref. 1, p. 51600-51601).

Grants Municipal Well B-38 was used to determine the travel time to the San Andres/Glorieta Aquifer. This well is 1 ¾ miles from the site, is at approximately the same elevation as the site (Ref. 4, USGS Grants Quadrangle). The drill log from this well indicates that a red sandy clay and boulder interval was encountered from 80 to 90 feet (ref. 41, p. 1-2). As shown by Table 10, this is the lowest conductivity layer encountered during drilling before the limestone of the San Andres Aquifer was encountered at 140 feet below ground surface. Table 3-6 in Section 3.1.2.4 of the HRS Rule specifies that this interval should be assigned a hydraulic conductivity of 10^{-8} cm/sec (Ref. 1, p. 51601). There are no other geologic materials with hydraulic conductivities of 10^{-8} cm/sec (i.e. clay, low permeability till, shale, unfractured metamorphic and igneous rocks), between the lowest known points of site related contamination and top of the aquifer being evaluated (Ref. 41, p. 1-2).

Based on a unit thickness greater than 5 feet, but less than 100 feet, and a hydraulic conductivity of less than 10^{-7}, Table 3-7 of the HRS Rule specifies a Travel Time Factor Value of 5 (Ref. 1, p. 51601).

Table 10: Summary of Geologic Material Encountered During the Drilling of Grants Municipal Well B-38 (Ref. 41, p. 1-2).

Depth in Feet		Type of Material Encountered
From	To	
0	7	Top soil
7	11	Broken lava & sand
11	44	Lava
44	80	Red sand, occasional boulders
80	90	Red sandy clay & boulders
90	120	Red sand & gravel
120	136	Cemented gravel
136	140	Large gravel cemented
140	142	Lime rock (San Andres Formation)

Travel Time Factor Value: 5

3.2 WASTE CHARACTERISTICS

3.2.1 Toxicity/Mobility

The following toxicity, mobility and combined toxicity/mobility factor values have been assigned to those substances associated with Source No. 1 which have a containment value greater than 0.

Table 11: Toxicity/Mobility Factor Values

Hazardous Substance	Source No.	Toxicity Factor Value	Mobility Factor Value	Toxicity/ Mobility	Reference
Arsenic	1	10000	1	10000	Ref. 2, p. BI-1
Beryllium	1	10000	1	10000	Ref. 2, p. BI-2
Cadmium	1	10000	1	10000	Ref. 2, p. BI-2
Chromium	1	10000	1	10000	Ref. 2, p. BI-3
1,1- DCE	1	100	1	100	Ref. 2, p. BI-5
cis-1,2- DCE	1	100	1	100	Ref. 2, p. BI-5
Lead	1	10000	1	10000	Ref. 2, p. BI-8
Nickel	1	10000	1	10000	Ref. 2, p. BI-9
PCE	1	100	1	100	Ref. 2, p. BI-11
TCE	1	10	1	10	Ref. 2, p. BI-11
Vinyl chloride	1	10000	1	10000	Ref. 2, p. BI-12
Zinc	1	10	1	10	Ref. 2, p. BI-12

Documentation for Toxicity/Mobility Values:

*The Mobility Factor Value for all hazardous substances in an observed release by chemical analysis to one or more aquifers underlying the source(s) at the site, regardless of the aquifer being evaluated, are assigned a mobility factor value of 1 (Ref. 1, p. 51601). The hazardous substances in Table 11 were observed in the shallow groundwater in the alluvial sediments at the site. The observed release to this strata is discussed in section 3.1.1 of this document.

Contaminant characteristic values for hazardous substances found in an observed release to Source 1 were derived from the Superfund Chemical Data Matrix (Ref.2). The hazardous substances with the highest toxicity/mobility factor value available to the groundwater migration pathway are arsenic (10,000), beryllium (10,000), cadmium (10,000), chromium (10,000), lead (10,000) nickel (10,000) and vinyl chloride (10,000).

Toxicity/Mobility Factor Value: 10,000

3.2.2 Hazardous Waste Quantity

Table 12 : Source Hazardous Waste Quantity Value

Source Number	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is source hazardous constituent quantity data complete? (yes/no)
1	10,436.4	No
Total	10,436.4	

A description of how the Source Hazardous Waste Quantity Value was obtained for Source 1 is described in section 2.4.1.5 of this document. This Source Waste Quantity Value was used to select a Hazardous Waste Quantity Factor Value from Table 2-6 of the HRS Rule (Ref. 1, p. 51591).

A Hazardous Waste Quantity Factor Value of 10,000 is assigned for the groundwater migration pathway.

3.2.3 Waste Characteristics Factor Category Value

As specified in the HRS Rule (Ref. 1, p. 51602), the Hazardous Waste Quantity Factor Value of 10,000 was multiplied by the highest Toxicity/Mobility Value of 10,000. The resultant product of 100,000,000 (1.0E+08) was used to select a Waste Characteristics Factor Value of 100 from Table 2-7 of the HRS Rule (Ref. 1, p. 51592).

Hazardous Waste Quantity Factor Value: 10,000

Waste Characteristics Factor Category Value: 100

3.3 TARGETS

The majority of the population within four miles of the site relies on municipal water systems. There is a city ordinance in Grants that prohibits the use of private wells to be used for drinking water within city limits (Ref. 16, p. 64). Five municipal wells are located within a four-mile radius of the site (Figure 4) (Ref. 38). Two of the municipal wells are owned by the City of Grants, one is owned by the Village of Milan, and two are owned by the Town of San Rafael.

Both of the Grants municipal water wells are located between one to two miles west of the site (Figure 4). These two wells (B-38 and B-40) are the only operational wells for the city of Grants water distribution system (Ref. 36). They produce water from the San Andres Limestone and Glorieta Sandstone Aquifer (Ref. 41, p. 3; Ref. 36, p. 1). The estimated population served by these wells is 12, 887 (Ref. 16, p. 137; Ref. 36, p. 1; Ref 65, 66, 67, 68, 69 and 70, p. 1-2). Well Number 3 (B-40) supplies about 90% of the municipal water for the city of Grants (Ref. 16, p. 138).

The village of Milan operates three municipal wells that supply drinking water to approximately 1,891 people (Ref. 16, p. 128-129; Ref. 71 and 72). Only one of the municipal wells (B-23) is located within four miles of the site. Well B-23 is located a little more than 3 miles north west of the site. This well also produces water from the San Andres Limestone and Glorieta Sandstone Aquifer (Ref. 16, p. 128-129). The Milan water distribution system is a blended system (Ref. 16, p. 129). Water production from the three municipal wells is rotated so that each well provides approximately equal amounts of water for the village of Milan; therefore no one well provides more than 40% of the water for the village (Ref. 16, p. 129).

The Town of San Rafael has two municipal wells (B-136 and B-137) that supply all of the water for their municipal supply system (Ref. 37, p. 2-3). These wells are located approximately 3 1/4 miles southwest of the site (Figure 4) (Ref. 37, p. 2). They supply water to about 879 people (Ref. 37, p. 2; Ref. 70, p. 1; Ref. 73). The San Rafael water supply system is a blended system with Well B-137 providing almost 100 percent of the supply (Ref. 16, p. 140; Ref. 37, p. 2). Both wells produce water from the San Andres/Glorieta Aquifer (Ref. 44 p. 1-3; Ref. 45, p. 1-2; Ref. 61, p. 66).

3.3 TARGETS (Continued)

The following wells have been identified within the 4-mile Target Distance Limit (TDL) of the site. All wells listed below are constructed within the San Andres/Glorieta Aquifer. The well locations can be seen in Figure 4.

Table 13: Drinking Water Wells within the TDL of the Site

Well	Distance From Source	Aquifer	Screened Interval	Total Depth	Well Population	Level of Contamination	Reference
Grants B-40	1 –2 Miles (see Fig. 4)	San Andres/Glorieta	246'-346'	367'	11,598	Potential	Ref. 16, p. 138; Ref. 36, p. 1; Ref. 41, p. 3-4; Ref. 65, 66, 67, 68, and 69; Ref. 70, p. 1
Grants B-38	1 –2 Miles (see Fig. 4)	San Andres/Glorieta	149'-300'	300'	1,289	Potential	Ref 16, p. 138; Ref. 36, p. 1; Ref. 41, p. 1-2; Ref. 65, 66, 67, 68, and 69; Ref. 70, p. 1
Milan B-23	3 - 4 Miles (see Fig. 4)	San Andres/Glorieta	NA	250'	630	Potential	Ref. 16, p. 128-129; Ref. 71; Ref. 72 p. 1
San Rafael B-137	3 - 4 Miles (see Fig. 4)	San Andres/Glorieta	75'-150'	150'	879	Potential	Ref. 16, p. 140; Ref. 37, p. 2; Ref. 44 p. 1-3; Ref. 45; Ref. 61, p. 66; Ref. 70, p. 1; Ref. 73
San Rafael B-136	3 - 4 Miles (see Fig. 4)	San Andres/Glorieta	NA	NA	0	Potential	Ref. 16, p. 140; Ref. 37; Ref. 44, p. 1-3; Ref. 45; Ref. 61, p. 66; Ref. 70, p. 1; Ref. 73

NA= Not Available

3.3.1 Nearest Well

Nearest Well: The nearest well to the site is Grants Municipal Well B-40. This well draws water from the San Andres Aquifer which is considered a karst aquifer (Ref. 16, p. 138; Ref. 36, p. 1; Ref. 39, p. 220;Ref. 40, p. 16; Ref. 41, p. 3-4; Ref. 61, p. 1, 31, 34; Ref. 62, p. 8, 14, 15; Ref. 64, p. 29).

Level of Contamination (I, II, or potential): Potential

If potential contamination, distance from source in miles: 1.5

Section 3.3.1 of the HRS Rule specifies that if one of the target aquifers is a karst aquifer that underlies any portion of the sources at the site and any well draws drinking water from this karst aquifer within the target distance limit, assign a value of 20 (Ref. 1, p. 51602-51603).

Nearest Well Factor Value: 20

3.3.2 Population

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

No drinking water wells were identified that were subject to Level I Concentrations.

Level Population Served by Level I Wells: 0

Level I Concentrations Factor Value: 0

3.3.2.3 Level II Concentrations

No drinking water wells were identified that were subject to Level II Concentrations.

Level Population Served by Level II Wells: 0

Level II Concentrations Factor Value: 0

3.3.2.4 Potential Contamination

Table 14: Population served by drinking water wells within each distance category and the distance-weighted population values for a karst aquifer.

Well Identification	Distance Category					
	0 to 1/4	>1/4 to 1/2	>1/2 to 1	>1 to 2	>2 to 3	>3 to 4
Grants B-40				11,598		
Grants B-38				1,289		
Milan B-23						630
San Rafael B-137						879
San Rafael B-136						0
Total Population				12,887		1509
Distance Weighted Population Value (Karst)				8,163		817

As specified in the HRS Rule, (Ref. 1, p. 51603), the number of people served by drinking water was determined within in each "Karst" distance category and a distance-weighted population value for each distance category was assigned. The population subject to potential contamination is based on the number of individuals regularly served by the 5 municipal wells within the 4-mile Target Distance.

Since this source is a groundwater plume (with no identified source), the center of the plume is used to locate the geographic location of the contamination (Ref.1, 51595). The geographical coordinates for the center of the plume are 35° 09' 20.88" latitude and –107° 50' 38.03" longitude (Ref. 4, Grants USGS Quadrangle Map; Ref. 58, p. 3). The geographical coordinates of the municipal wells were then used determine their distance from the center of the plume (Reference 38).

City of Grants

Municipal wells B-38 and B-40 are part of a blended system that provide drinking water for 12,887 people (Ref. 36; Ref. 16, p. 137, 138; Ref. 65, 66, 67, 68, 69 and 70). This estimate of the target population served by the Grants Municipal Water system was calculated as

follows. There are 3,150 metered water connections in the Grants Water System (Ref. 65). Six of these connections each serve a relatively large number of people (Ref. 66, 67, 68, and 69). Four of the connections are for schools in the city of grants and two of the connections are for correctional facilities (Ref. 66, 67, 68, and 69). Section 3.3.2 of the HRS rule specifies to count residents, students, and workers who regularly use the water (Ref 1, p. 51603). Table 15 shows the student populations for each of the four schools and the inmate/employee populations for each of the two correctional facilities.

The resident population was calculated by excluding the 6 connections used for the student, worker, and inmate populations from the total number of connections, and multiplying that number by the average number of persons per household. Section 3.3.2 of the HRS rule states that in determining residential population, when the estimate is based on the number of residences, multiply each residence by the average number of persons per residence for the county in which the residence is located (Ref. 1, p. 51603). There are a total of 3,144 metered water connections after excluding the six used for the schools and correctional facilities (Ref. 65). The average persons per household for Cibola County is 2.95 (Ref. 70, p. 1). This yields a resident population of 9,274.

Table 15: Target Population for the City of Grants calculated from metered connections, student populations at local schools, and worker and inmate populations at the local correctional facilities.

Drinking Water Connection	Population Served	References
3,144 Metered Residential Water Connections (2.95 persons per household)	9,274 Residents	Ref. 65; Ref. 70
Grants High School	856 Students	Ref. 66
Los Alamitos Middle School	499 Students	Ref. 66
Mt. Taylor Elementary School	551 Students	Ref. 66
Mesa View Elementary School	481 Students	Ref. 66
Western New Mexico Correctional Facility	410 Inmates 225 Employees	Ref. 67; Ref. 68
New Mexico Women's Correctional Facility	511 Inmates 80 Employees	Ref. 69
Total Population	12,887	

Section 3.3.2 of the HRS rule states that for a blended system, if the relative contribution of one well exceeds 40 percent, estimate the relative contribution of the wells (Ref. 1, p. 51603). Well B-40 supplies 90% of the total supply so that it serves approximately 11,598 people (Ref. 16, p. 138). B-38 supplies the remaining 10% which accounts for 1,289 people (Ref. 16, p. 138).

Village of Milan

The village of Milan operates three municipal wells that supply drinking water to approximately 1,891 people (Ref. 16, p. 128-129; Ref. 71; Ref. 72, p. 1). The population served by the Milan municipal water system was estimated from the total population for the Village of Milan reported in the 2000 census (Ref. 72, p. 1). This population was used rather than the number of water connections because many of the water connections in Milan are for commercial use along the state highway (Ref. 71). The number of water connections multiplied by the number of persons per household may give an erroneously high estimate of the resident population.

Only one of the Milan municipal wells (B-23) is located a little more than 3 miles north west of the site. The Milan water distribution system is a blended system (Ref. 16, p. 129). Water production from the three municipal wells is rotated so that each well provides approximately equal amounts of water for the village of Milan (Ref. 16, p. 129).

Section 3.3.2 of the HRS rule specifies that if no one well provides more than 40% of the water as part of a blended system, assume each well and intake contributes equally and apportion the population accordingly (Ref. 1, p. 51603).

A population of 630 people was assigned to Milan Well B-23 as 1/3 of the total population of Milan.

Town of San Rafael

The Town of San Rafael has two municipal wells (B-136 and B-137) that supply all of the water for their municipal supply system (Ref. 16, p. 140; Ref. 37). These wells are located approximately 3 ¼ miles southwest of the site (Figure 4) (Ref. 37). They supply water to about 879 people (Ref. 37; Ref. 70, p. 1; Ref. 73). This population was estimated from the 298 water connections in San Rafael and an average of 2.95 persons per household in Cibola County (Ref. 70, p. 1; Ref. 73).

The San Rafael water supply system is a blended system with Well B-137 providing almost 100 percent of the supply (Ref. 16, p. 140; Ref. 37). A population of 879 people was assigned to San Rafael Well B-137.

Distance Weighted Population

The Distance Weighted Population Values were summed for a total of 8,980 and according to Section 3.3.2.4 of the HRS Rule was divided by 10, for a product of 898.

Potential Contamination Factor Value: 898

3.3.3 RESOURCES

No water resources were identified that apply to San Andres/Glorieta Aquifer.

Resources Factor Value: 0

3.3.4 WELLHEAD PROTECTION AREA

There are no wellhead protection areas set for any of the municipal wells in Grants, Milan, or San Rafael (Ref. 46, Ref. 47).

Wellhead Protection Area Factor Value: 0

3.3.5 Calculation of targets factor Category Value

The target factor category value is calculated by determining the sum of the factor values for the nearest well (20.0), population (898), resources (0.0), and Wellhead Protection Area (0.0) (Ref. 1, p. 51604).

Calculations: 20.0 + 898 + 0.0 + 0.0 = 918

3.4 Groundwater Migration Score for an Aquifer

The groundwater migration score for an aquifer is calculated by multiplying the factor category values for likelihood of release (90.0), waste characteristics (100.0), and targets (918). Divide by 82,500, the resulting value (maximum value 100) is assigned as the groundwater migration pathway score (Ref. 1, p. 51604).

Calculations: (90 x 100 x 918) ÷ 82,500 = 100.14 (100 maximum)

3.5 Calculation of Groundwater Migration Pathway Score

The groundwater migration pathway Score is calculated by assigning the highest groundwater migration score for the San Andres-Glorieta Aquifer (100.0).

2.1.1 calculation of HRS Site Score

The HRS site score is calculated by using the root-mean-square equation which squares each pathway score then takes the sum of all four pathways and divides the sum by 4 then takes the square root which is the site score (Ref. 1, Section 2.1.1).

Calculations:

Pathway Scores
GW Pathway $[100.0]^2 = 10{,}000$
SW pathway NE = 0
Soil Pathway NE = 0
Air Pathway NE = 0
(NE = not evaluated)

$$S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2 =$$
$$10{,}000 + 0 + 0 + 0 = 10{,}000$$
$$10{,}000 \div 4 = 2{,}500$$

square root of which = 50.00

HRS Site Score: 50.00

4.0 Surface Water Pathway

4.0.1 General Considerations

The Surface Water Pathway was not evaluated because the site scored on a contaminated groundwater plume. There is no observed release for the Surface Water Pathway.

5.0 Soil Exposure Pathway

5.0.1 General Considerations

There is an observed release for the Soil Exposure Pathway. The area of observed contaminated soil covers approximately 11,000 square feet. At least seven residents live where the area of observed contamination lies within their property and their residence is within 200 feet. The Resident Population Threat, and Nearby Population Threat, were not scored because the site scored on a contaminated groundwater plume. Scoring this pathway would not add significantly to the site score.

For more information regarding soil contamination at the site, refer to the Grants Chlorinated Solvents Plume Site Inspection Report (Ref. 53, p. 5-6, 11-12, 19-20).

6.0 Air Migration Pathway

6.1.1 Observed Release

The air migration pathway was not evaluated because the site scored on a contaminated groundwater plume. There is no observed release for the Air Migration Pathway.

Copies of *Figures 1 - 6* are available at the EPA Headquarters Superfund Docket:

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